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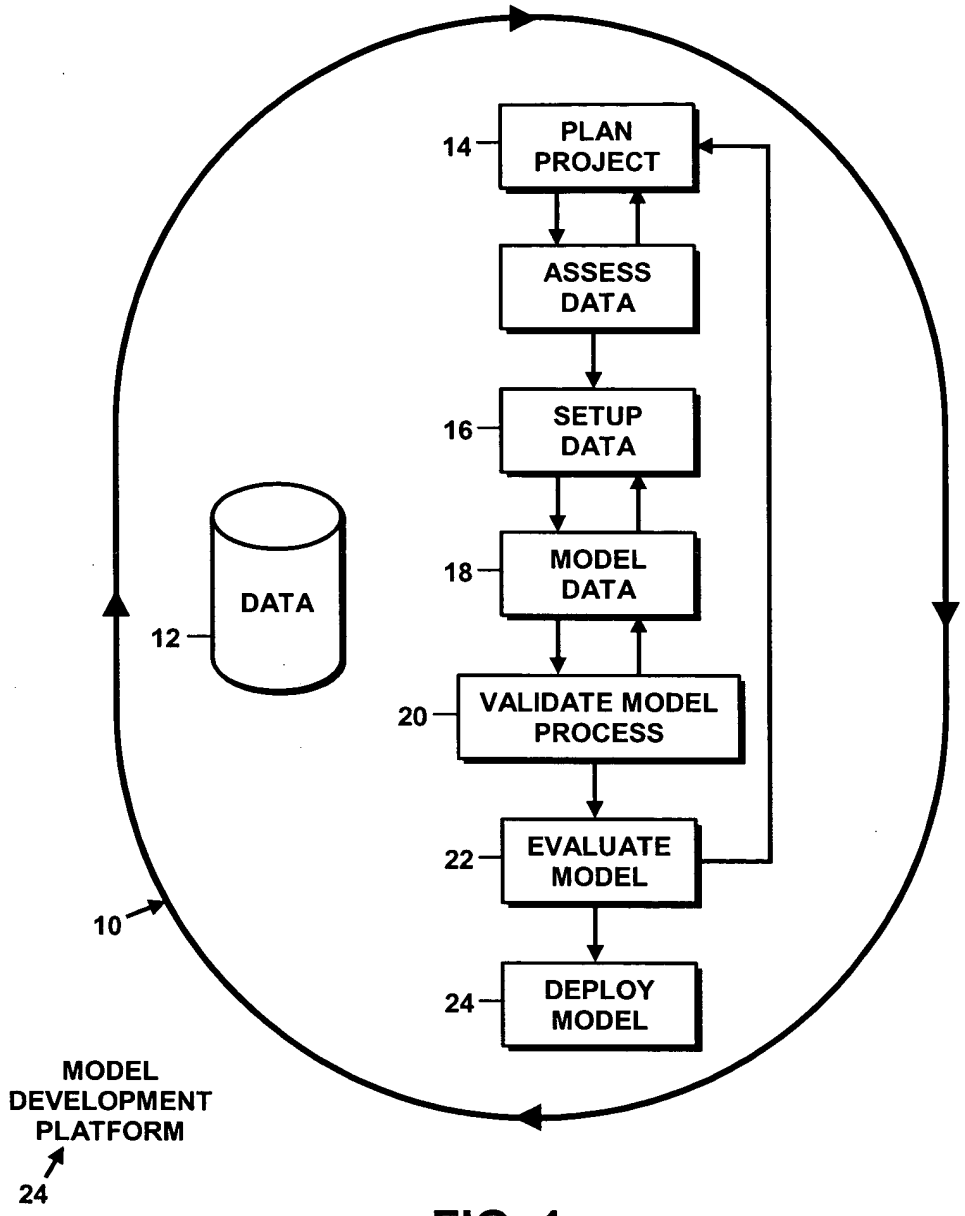

14
PLAN PROJECT
ASSESS DATA
16
SETUP DATA
18
MODEL DATA
20
VALIDATE MODEL PROCESS
22
EVALUATE MODEL
24
DEPLOY MODEL
DATA
12
10
MODEL DEVELOPMENT PLATFORM
24

FIG. 1

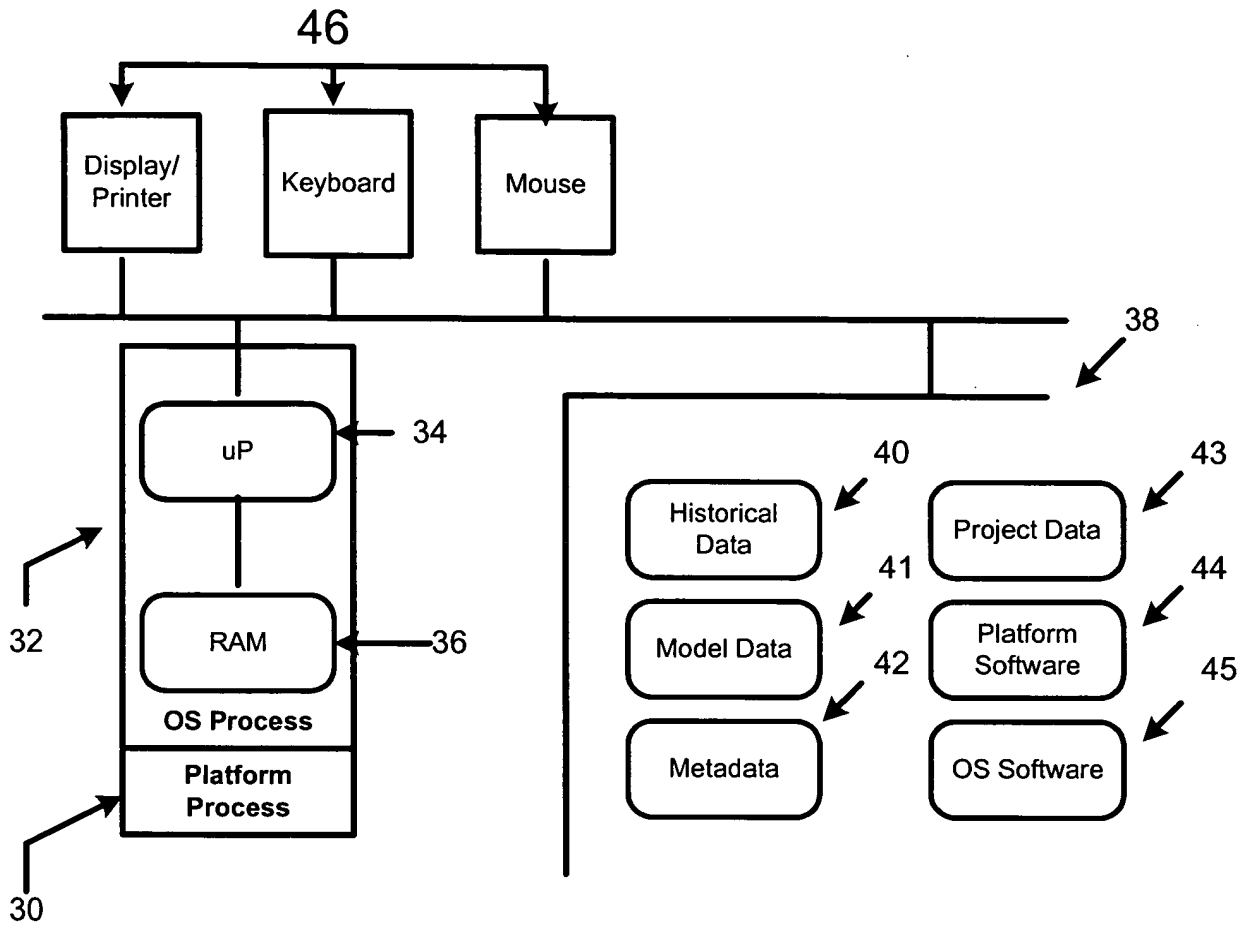

46
Display/ Printer
Keyboard
Mouse
38
uP
34
40
43
Historical Data
Project Data
41
44
32
RAM
36
Model Data
Platform Software
42
45
OS Process
Metadata
OS Software
Platform Process
30

FIGURE 2

50

52

ModelProperties Table

Field Name	Data Type	Description
ProjectID	AutoNumber	Unique Number indexing Model Projects
ProjectName	Text	Reference Name for Model Project
ProjectType	Text	Type of Model to be constructed (Response, Clone, Suppression, ...)
ProjectGoal	Text	Analyst-defined goal for current Model Project
ProjectBeginDate	Date/Time	Identifying Time Stamp for first use
ProjectEndDate	Date/Time	Last used Time Stamp
ProjectDataset	Text	Full pathname reference to Development dataset
ProjectDataDictionary	Text	Full pathname reference to metadata and Model status and data
ProjectLog	Text	Full pathname reference to log of Analyst decisions
DependentVariable	Text	Target variable selected for Model
ModelFitnessCriterion	Number	Desired c-index for Model set by Analyst
ModelPerformanceCriterion	Number	Desired zone of positive Model Gain set by Client
ModelPerformanceMonotonicityCriterion	Number	Desired level of Monotonicity
DevelopmentDatasetSize	Number	Total number of records in Development Dataset
PositiveOutcomes(%)	Number	Number of successful outcomes as a percent of Development Dataset Size
SampleSize(%)	Number	Size of Training Sample as a percent of total Development Dataset Size used for Candidate Model
VariableCount	Number	Initial Number of Predictor Variables
SampleDistribution	Hyperlink	Distribution of Predictor Variables: Graphs and Statistics
SampleByDistribution	Hyperlink	Distribution of Predictor Variables for Positive and Negative Outcomes
Interaction Tree	Hyperlink	Cross-validated Partition Tree for Key Predictor Variables
DimensionReductionMissingFilter	Number	Number of Predictor Variables Eliminated for Missing Variables
DimensionReductionCutoff	Number	Cutoff set by Analyst for Percent of Missing Values Acceptable
DimensionReductionMainEffects	Number	Number of Predictor Variables Retained for Main Effects
DimensionReductionMainEffectsCutoff	Number	Cutoff set by Analyst for Significance of Main Effects
DimensionReductionInteractionEffects	Number	Number of Predictor Variables Retained for Interaction Effects
DimensionReductionInteractionEffectsCutoff	Number	Cutoff set by Analyst for Significance of Interaction Effects
DimensionReductionVariableCount	Number	Number of Predictor Variables resulting from Dimension Reduction
CandidateModelChoice	Text	Model Type applied to Dimension Reduced Dataset
CandidateModelChoiceConstraint	Number	Retention Cutoff or Significance Level for Model Variables
CandidateModelResults	Hyperlink	Model Fitting Results
CandidateModelLiftChart	Hyperlink	Model Non-cumulative Lift Chart
CandidateModelPersistenceChart	Hyperlink	Model Persistence Chart for Key Variables
ValidationMethod	Text	Method Selected for Model Development Process Validation
ValidationMethodResults	Hyperlink	Model Application to Validation Dataset(s) Results
ValidationMethodLiftChart	Hyperlink	Model Validation Lift Chart
FinalModelResults	Hyperlink	Model Development Process applied to full Development Dataset Results
FinalModelLiftChartComparison	Hyperlink	Final Model applied to Sample and Validation Datasets for Cumulative Lift
FinalModelNonCumulativeLiftChartComparison	Hyperlink	Final Model applied to Sample and Validation Datasets for Non-cumulative Lift
FinalModelEquation	Text	Model Parameterized Equation using Model Transformed Variables
ScoringDataset	Text	Full pathname reference to Scoring File Input Dataset
DevelopmentScoringComparison	Hyperlink	Key Variable Comparison on Decile Basis
DevelopmentScoringDistributionComparison	Hyperlink	Propensity Score Distribution for Development and Scoring File (Subset)
ScoredResults	Text	Full pathname reference to Scoring File Output Dataset
InsightProfileMethod	Text	Method for Ranking Customer Insight Variables
InsightProfile	Hyperlink	Ranked List of Key Variables
InsightProfileChart	Hyperlink	Insight Chart of Key Variable Differential Contribution
FinalReportEntry	Memo	Final Report Description and Comments

54 56 58 60 62

FIGURE 3

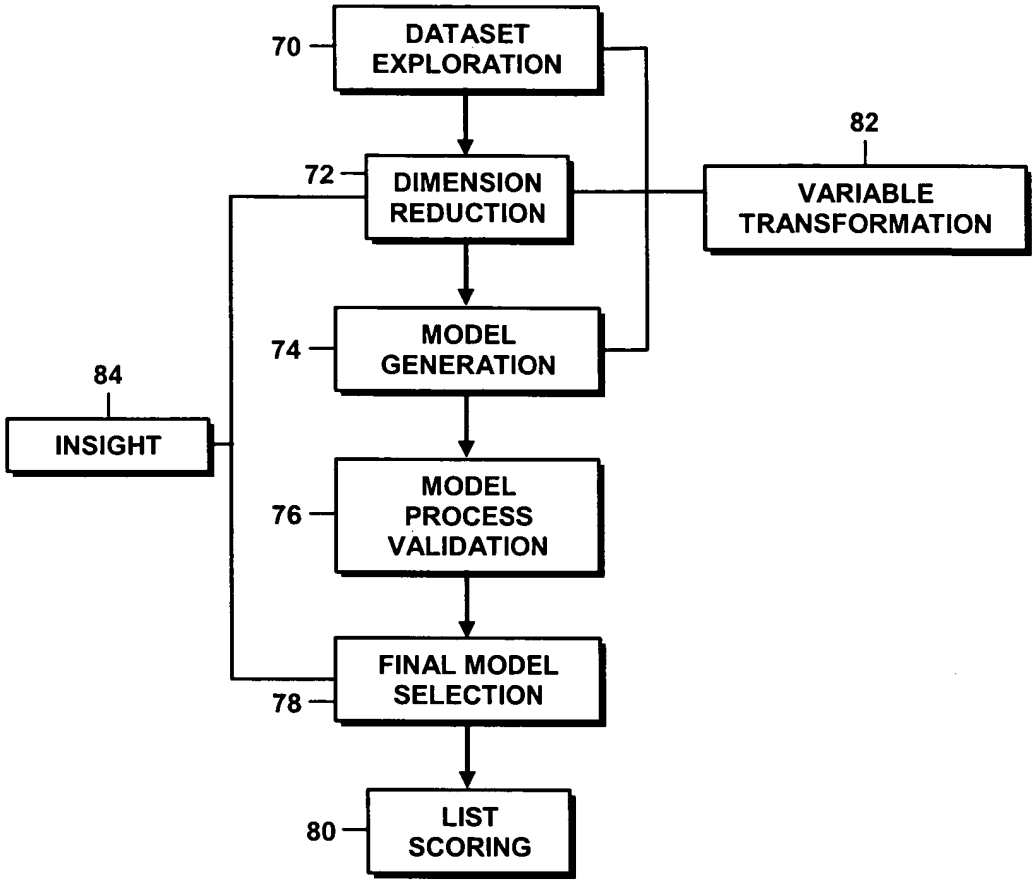

70
DATASET EXPLORATION
72
DIMENSION REDUCTION
74
MODEL GENERATION
76
MODEL PROCESS VALIDATION
78
FINAL MODEL SELECTION
80
LIST SCORING
82
VARIABLE TRANSFORMATION
84
INSIGHT

FIG. 4

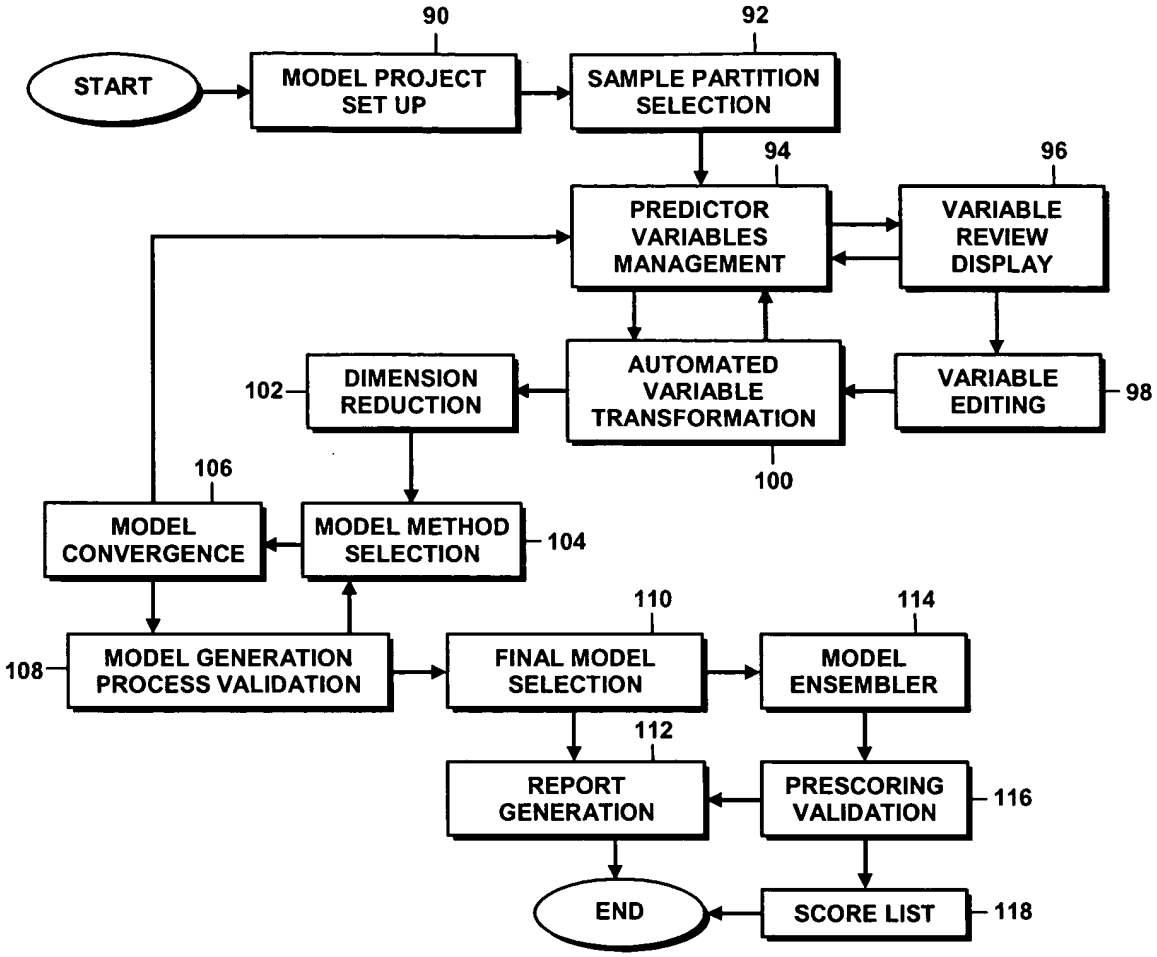

START
90
MODEL PROJECT SET UP
92
SAMPLE PARTITION SELECTION
94
PREDICTOR VARIABLES MANAGEMENT
96
VARIABLE REVIEW DISPLAY
102
DIMENSION REDUCTION
AUTOMATED VARIABLE TRANSFORMATION
VARIABLE EDITING
98
100
106
MODEL CONVERGENCE
MODEL METHOD SELECTION
104
108
MODEL GENERATION PROCESS VALIDATION
110
FINAL MODEL SELECTION
114
MODEL ENSEMBLER
112
REPORT GENERATION
PRESCORING VALIDATION
116
END
SCORE LIST
118

FIG. 5

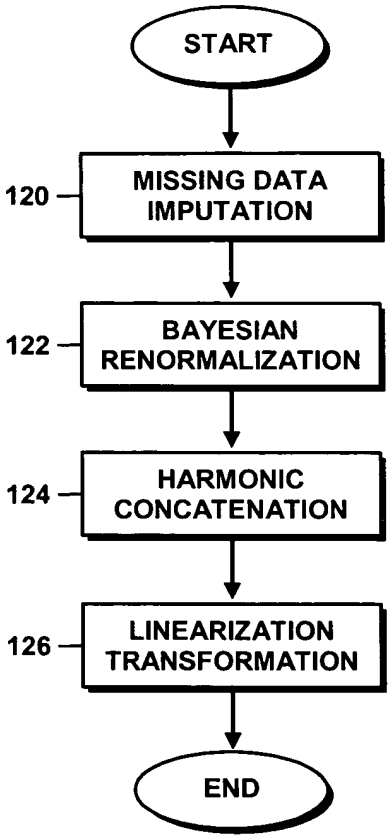

START
120
MISSING DATA IMPUTATION
122
BAYESIAN RENORMALIZATION
124
HARMONIC CONCATENATION
126
LINEARIZATION TRANSFORMATION
END

FIG. 6

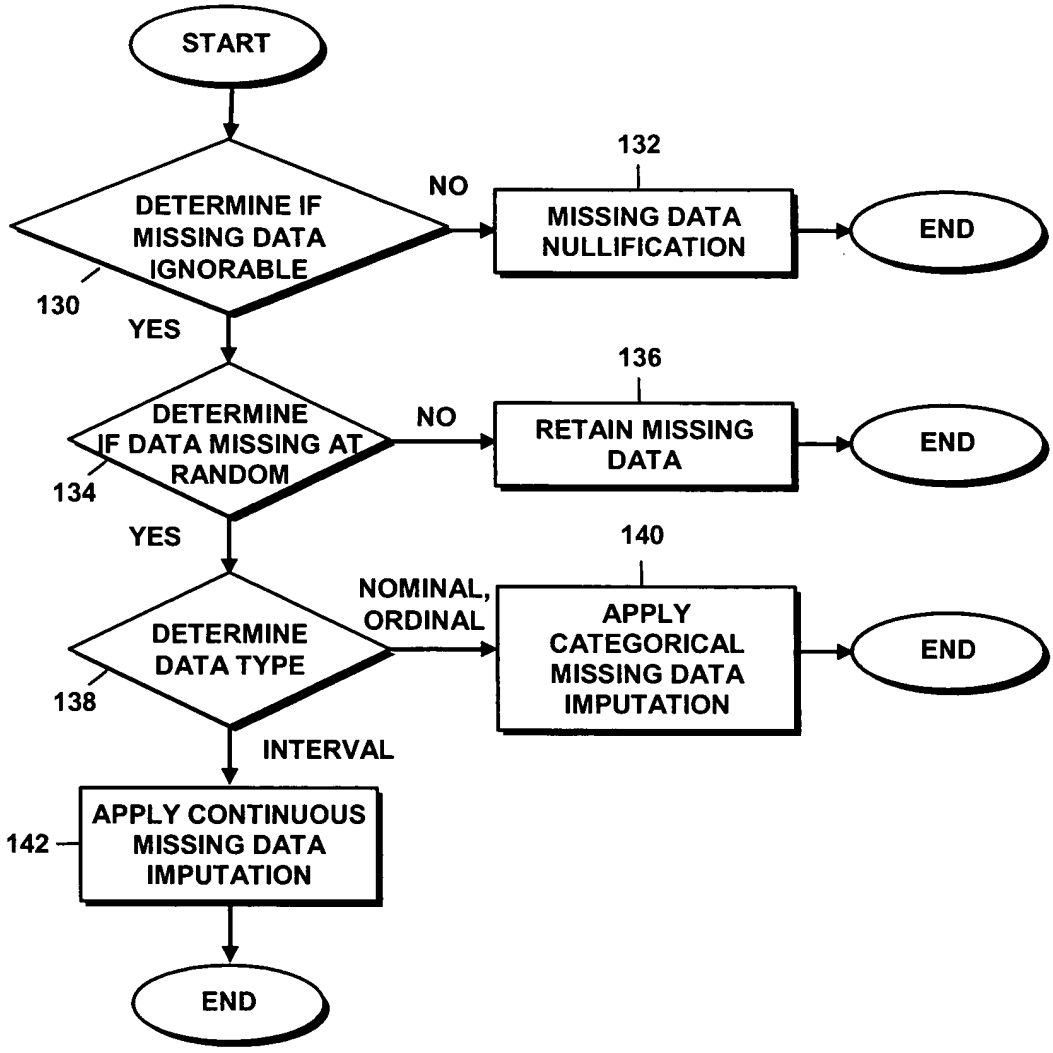

START
DETERMINE IF MISSING DATA IGNORABLE
130
NO
132
MISSING DATA NULLIFICATION
END
YES
DETERMINE IF DATA MISSING AT RANDOM
134
NO
136
RETAIN MISSING DATA
END
YES
DETERMINE DATA TYPE
138
NOMINAL, ORDINAL
140
APPLY CATEGORICAL MISSING DATA IMPUTATION
END
INTERVAL
APPLY CONTINUOUS MISSING DATA IMPUTATION
142
END

FIG. 7

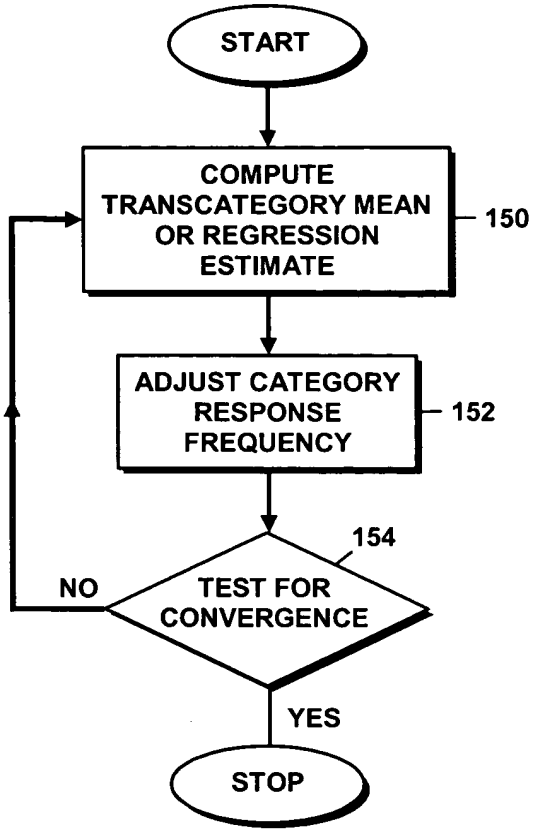

START
COMPUTE TRANSCATEGORY MEAN OR REGRESSION ESTIMATE
150
ADJUST CATEGORY RESPONSE FREQUENCY
152
154
TEST FOR CONVERGENCE
NO
YES
STOP

FIG. 8

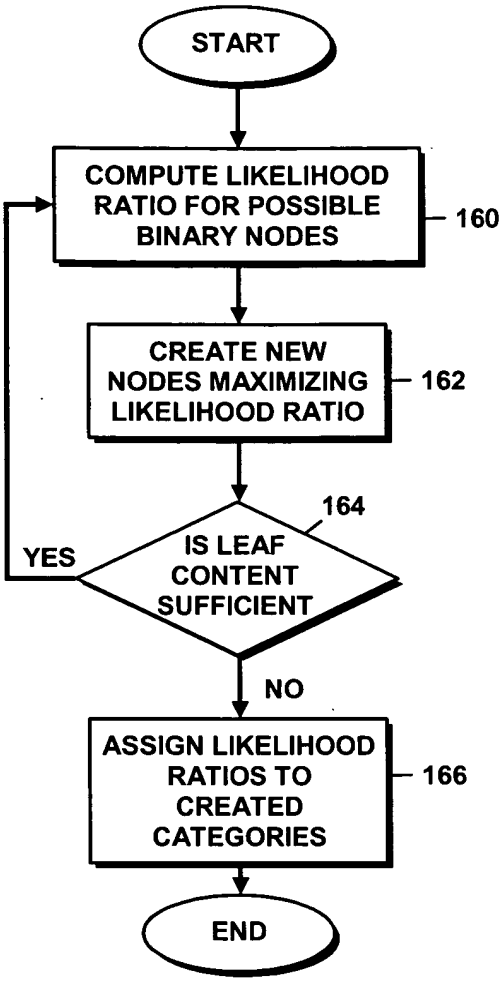

START
COMPUTE LIKELIHOOD RATIO FOR POSSIBLE BINARY NODES
160
CREATE NEW NODES MAXIMIZING LIKELIHOOD RATIO
162
164
IS LEAF CONTENT SUFFICIENT
YES
NO
ASSIGN LIKELIHOOD RATIOS TO CREATED CATEGORIES
166
END

FIG. 9

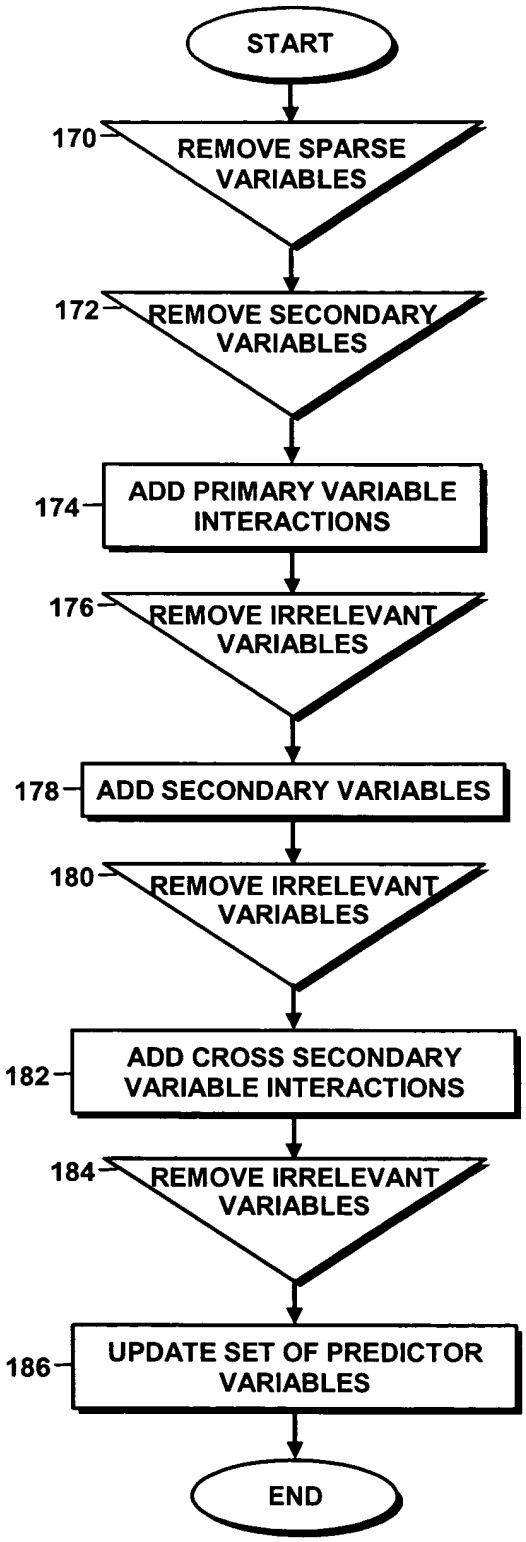

START
170
REMOVE SPARSE VARIABLES
172
REMOVE SECONDARY VARIABLES
174
ADD PRIMARY VARIABLE INTERACTIONS
176
REMOVE IRRELEVANT VARIABLES
178
ADD SECONDARY VARIABLES
180
REMOVE IRRELEVANT VARIABLES
182
ADD CROSS SECONDARY VARIABLE INTERACTIONS
184
REMOVE IRRELEVANT VARIABLES
186
UPDATE SET OF PREDICTOR VARIABLES
END

FIG. 10

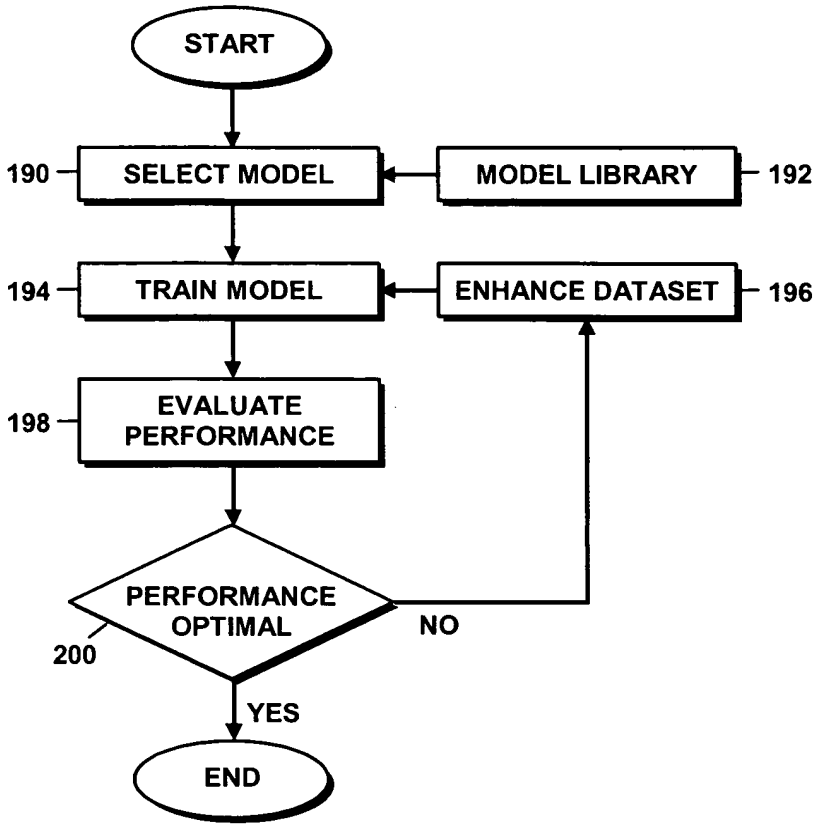

START
190
SELECT MODEL
MODEL LIBRARY
192
194
TRAIN MODEL
ENHANCE DATASET
196
198
EVALUATE PERFORMANCE
PERFORMANCE OPTIMAL
200
NO
YES
END

FIG. 11

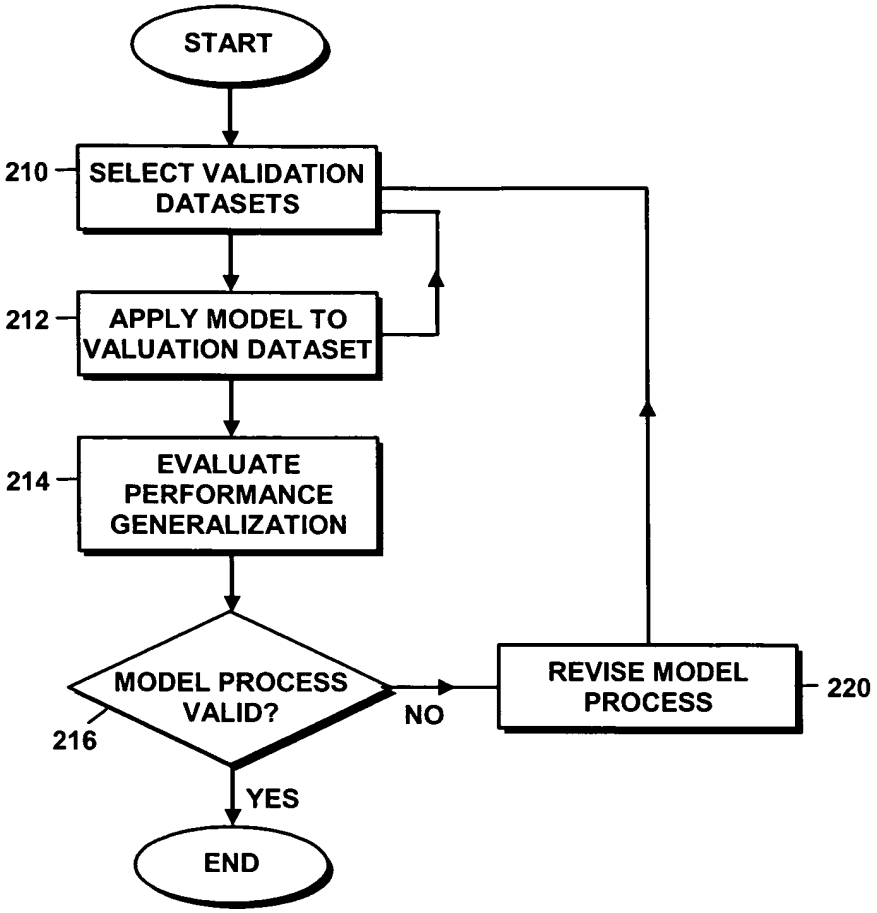

START
210
SELECT VALIDATION DATASETS
212
APPLY MODEL TO VALUATION DATASET
214
EVALUATE PERFORMANCE GENERALIZATION
MODEL PROCESS VALID?
216
NO
REVISE MODEL PROCESS
220
YES
END

FIG. 12

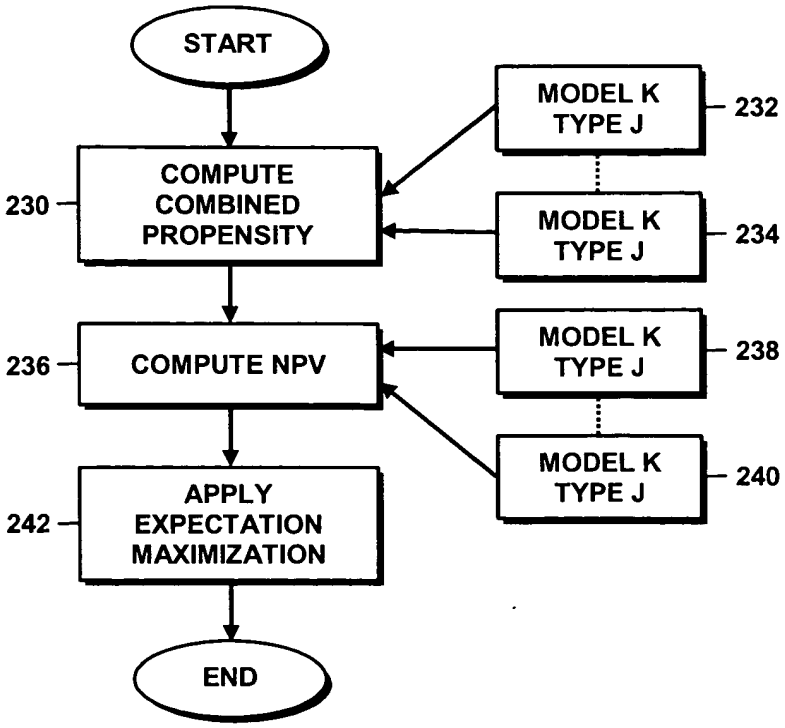

START
MODEL K TYPE J
232
230
COMPUTE COMBINED PROPENSITY
MODEL K TYPE J
234
236
COMPUTE NPV
MODEL K TYPE J
238
MODEL K TYPE J
240
242
APPLY EXPECTATION MAXIMIZATION
END

FIG. 13

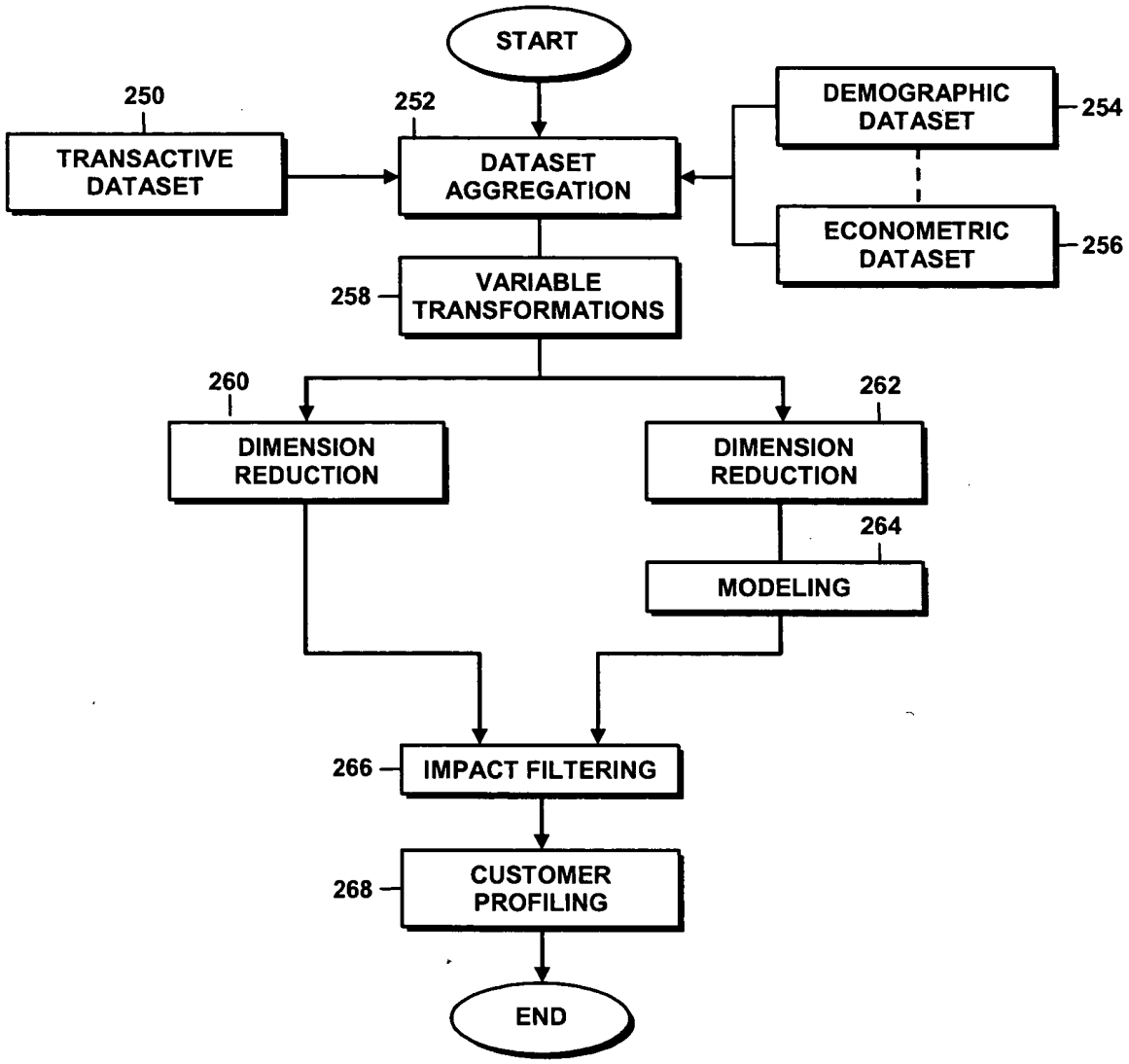

START
250
TRANSACTIVE DATASET
252
DATASET AGGREGATION
DEMOGRAPHIC DATASET
254
ECONOMETRIC DATASET
256
258
VARIABLE TRANSFORMATIONS
260
DIMENSION REDUCTION
262
DIMENSION REDUCTION
264
MODELING
266
IMPACT FILTERING
268
CUSTOMER PROFILING
END

FIG. 14

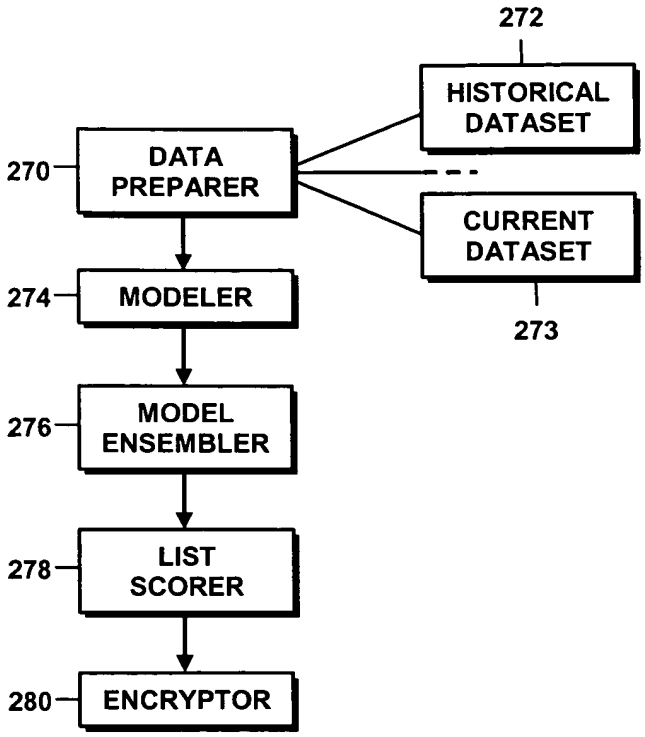

272
HISTORICAL DATASET
270
DATA PREPARER
CURRENT DATASET
273
274
MODELER
276
MODEL ENSEMBLER
278
LIST SCORER
280
ENCRYPTOR

FIG. 15

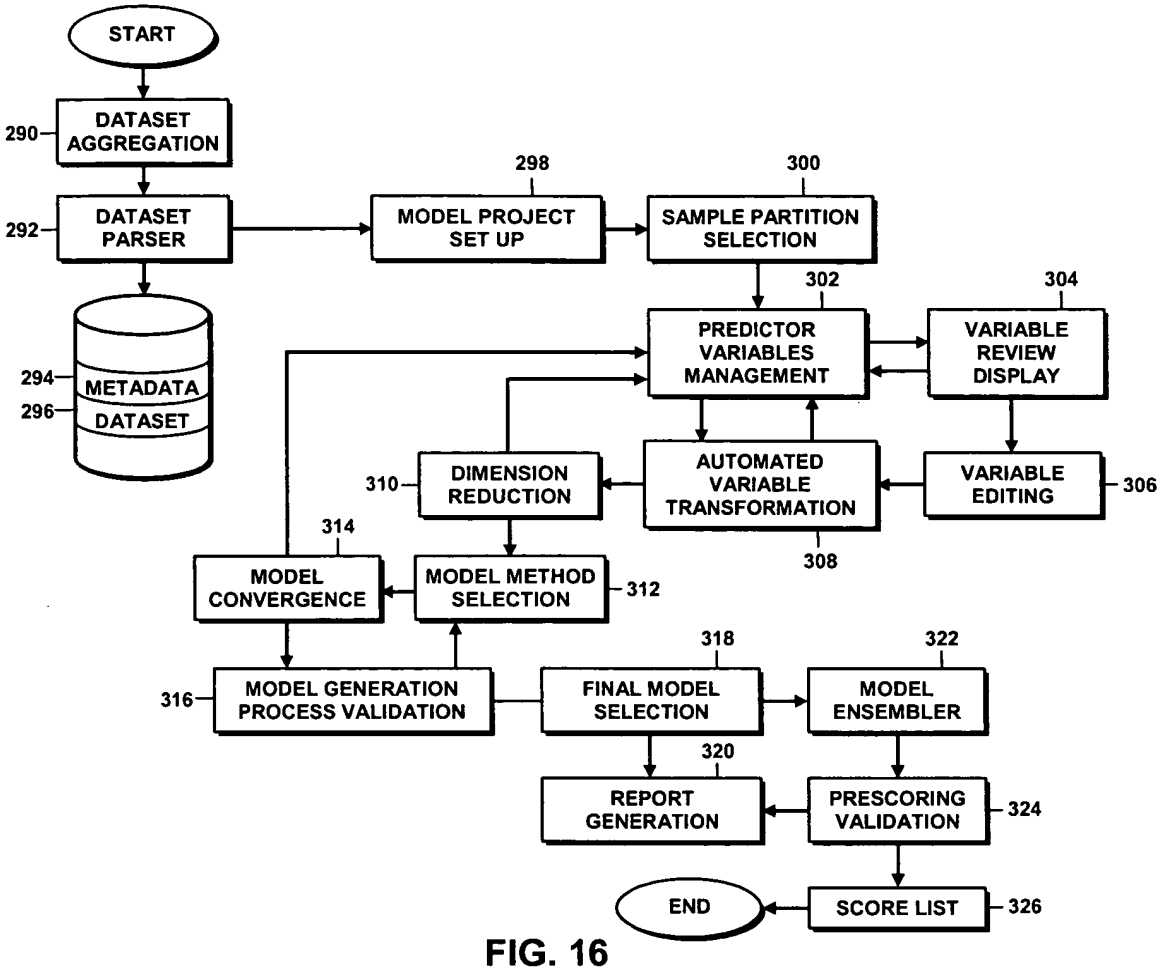

START
290
DATASET AGGREGATION
292
DATASET PARSER
294
METADATA
296
DATASET
298
MODEL PROJECT SET UP
300
SAMPLE PARTITION SELECTION
302
PREDICTOR VARIABLES MANAGEMENT
304
VARIABLE REVIEW DISPLAY
306
VARIABLE EDITING
308
AUTOMATED VARIABLE TRANSFORMATION
310
DIMENSION REDUCTION
312
MODEL METHOD SELECTION
314
MODEL CONVERGENCE
316
MODEL GENERATION PROCESS VALIDATION
318
FINAL MODEL SELECTION
320
REPORT GENERATION
322
MODEL ENSEMBLER
324
PRESCORING VALIDATION
326
SCORE LIST
END

FIG. 16

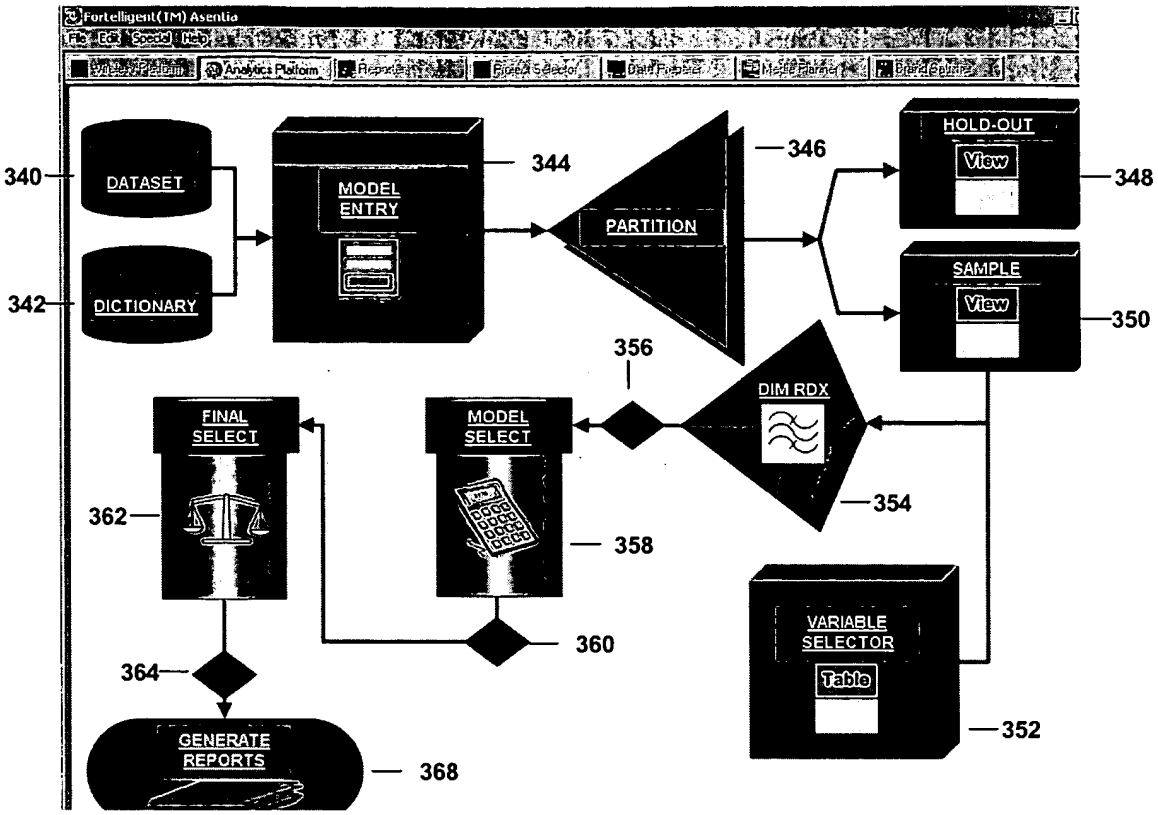

Fortelligent(TM) Asentia
Analytics Platform
340
DATASET
342
DICTIONARY
MODEL ENTRY
344
PARTITION
346
HOLD-OUT
View
348
SAMPLE
View
350
356
DIM RDX
354
FINAL SELECT
362
MODEL SELECT
358
360
VARIABLE SELECTOR
Table
352
364
GENERATE REPORTS
368

FIG. 17

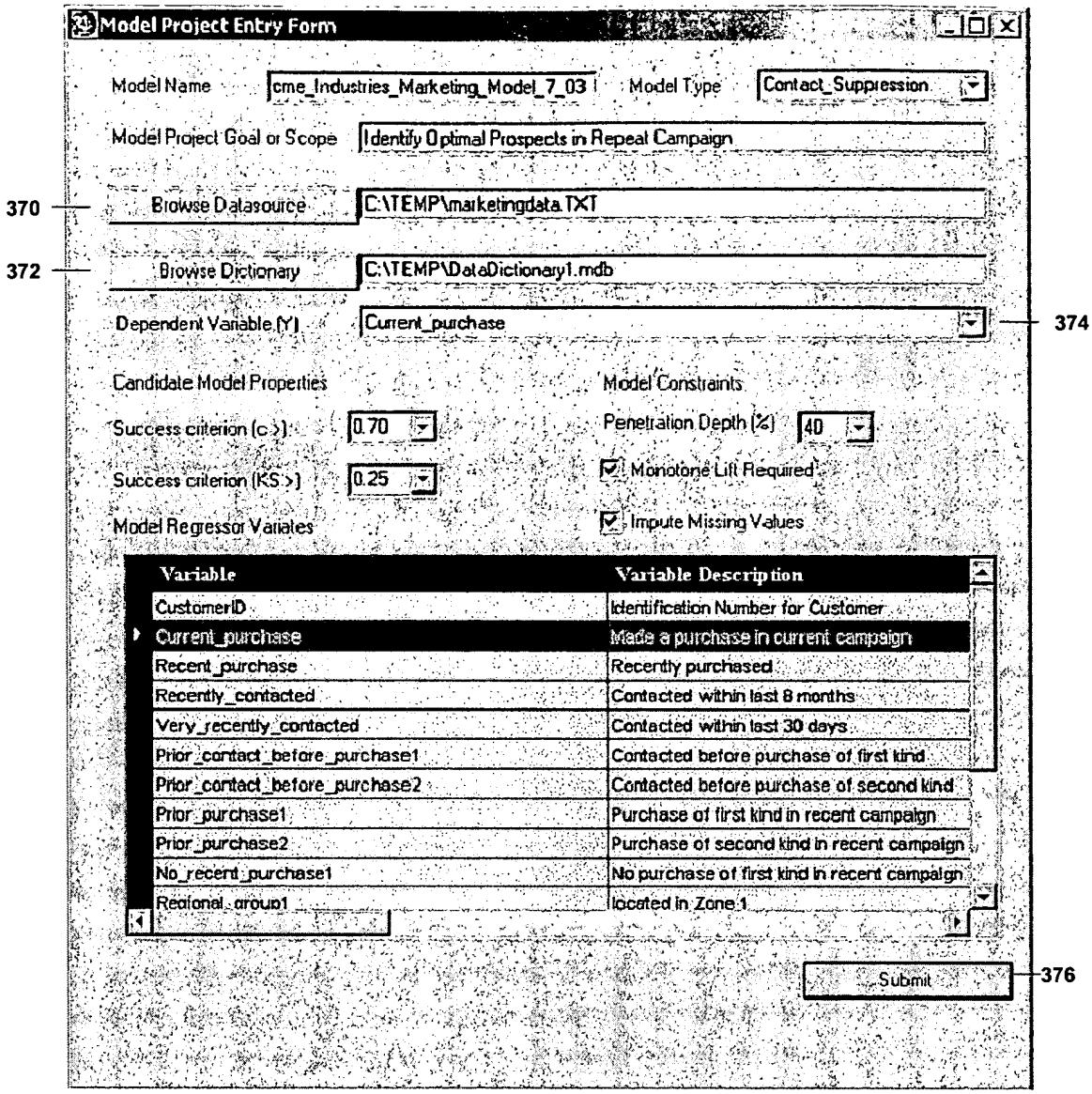


FIG. 18A

DataDictionary : Table

Variable	Variable Type	Variable Description	Variable Definition	Status
CustomerID	N	Identification Number for Customer	CustomerID	XP
Current_purchase	N	Made a purchase in current campaign	Current_purchase	P
Recent_purchase	N	Recently purchased	Recent_purchase	P
Recently_contacted	N	Contacted within last 8 months	Recently_contacted	P
Very_recently_contacted	N	Contacted within last 30 days	Very_recently_contacted	P

FIG. 18B

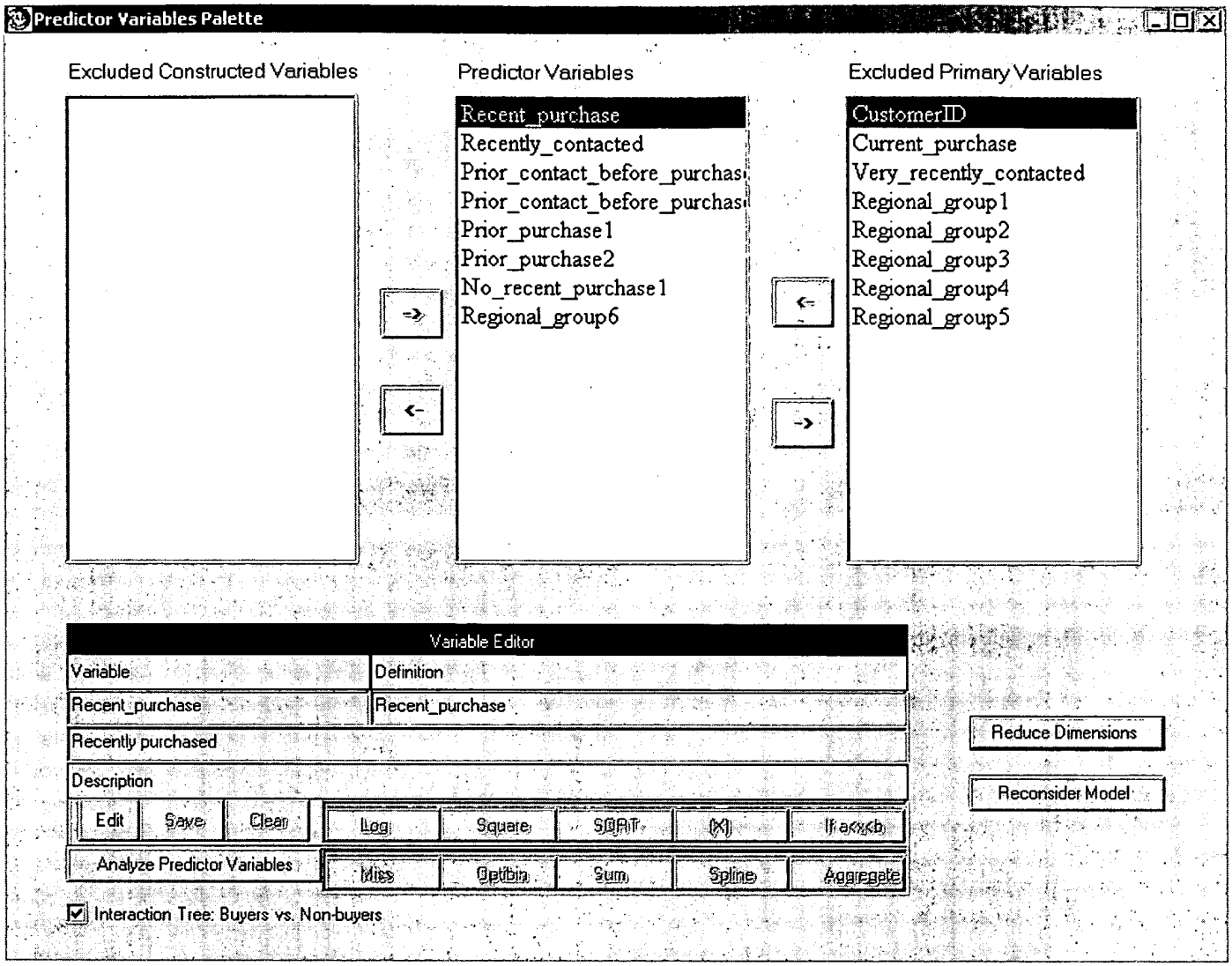

Predictor Variables Palette
Excluded Constructed Variables
Predictor Variables
Excluded Primary Variables
Recent_purchase
Recently_contacted
Prior_contact_before_purchas
Prior_contact_before_purchas
Prior_purchase1
Prior_purchase2
No_recent_purchase1
Regional_group6
CustomerID
Current_purchase
Very_recently_contacted
Regional_group1
Regional_group2
Regional_group3
Regional_group4
Regional_group5
Variable Editor
Variable
Definition
Recent_purchase
Recent_purchase
Recently purchased
Description
Edit
Save
Clear
Log
Square
SQRT
(X)
If a<x<b
Analyze Predictor Variables
Mins
Optbin
Sum
Spline
Aggregate
Reduce Dimensions
Reconsider Model
Interaction Tree: Buyers vs. Non-buyers

FIG. 19.

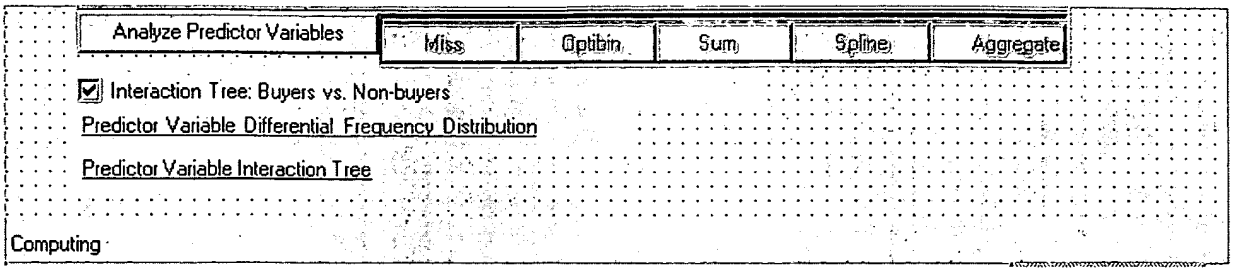


FIG. 20A

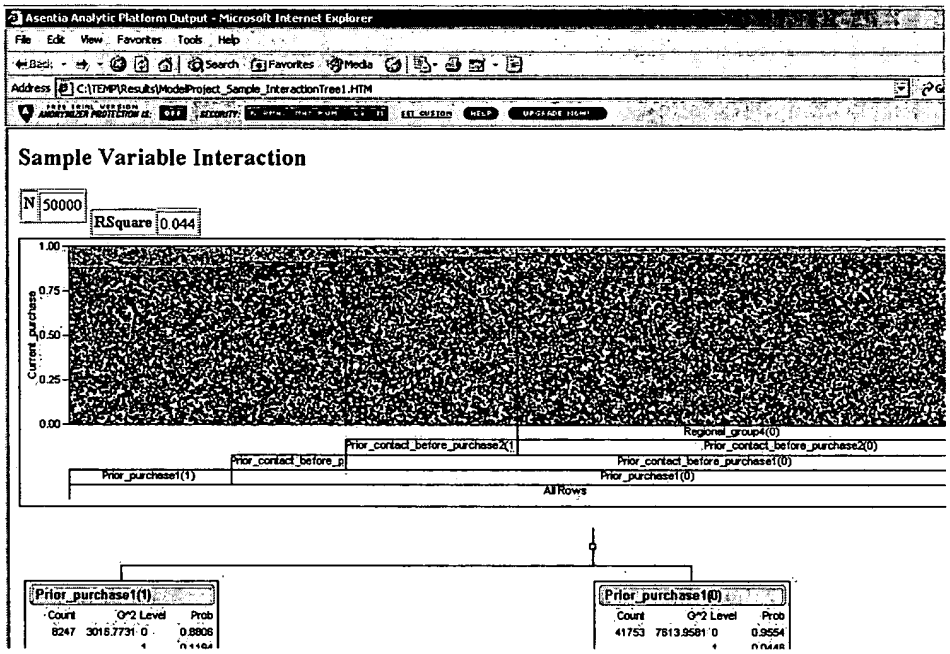


FIG. 20B

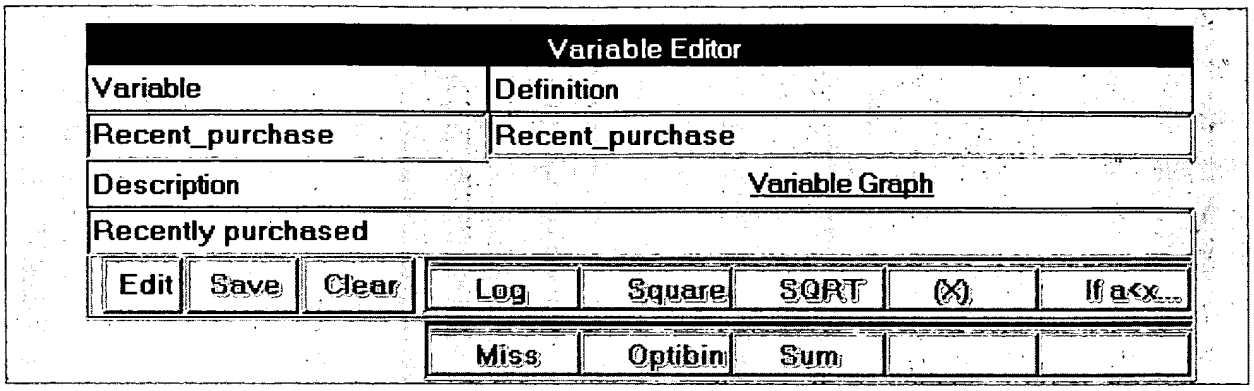


FIG. 21A

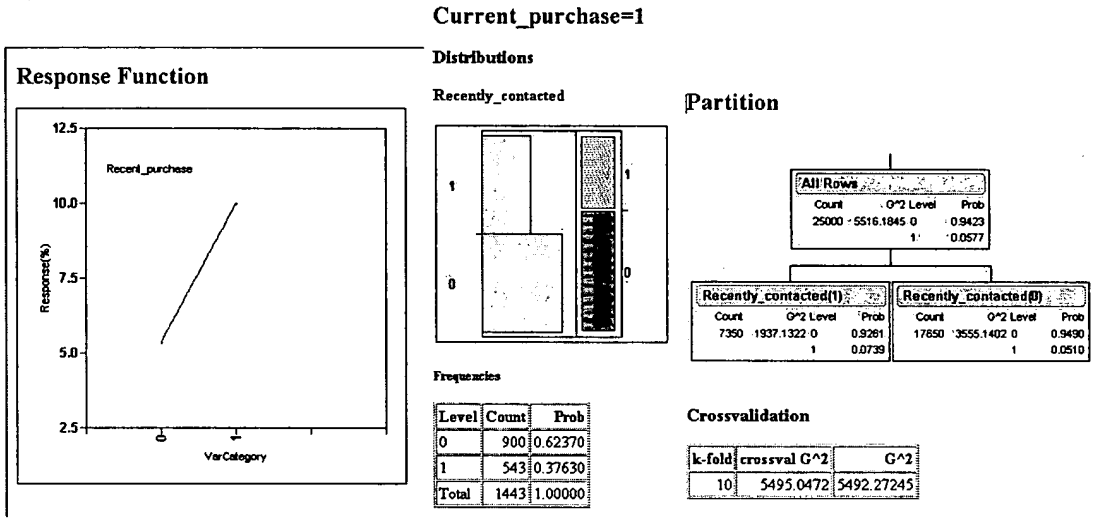


FIG. 21B

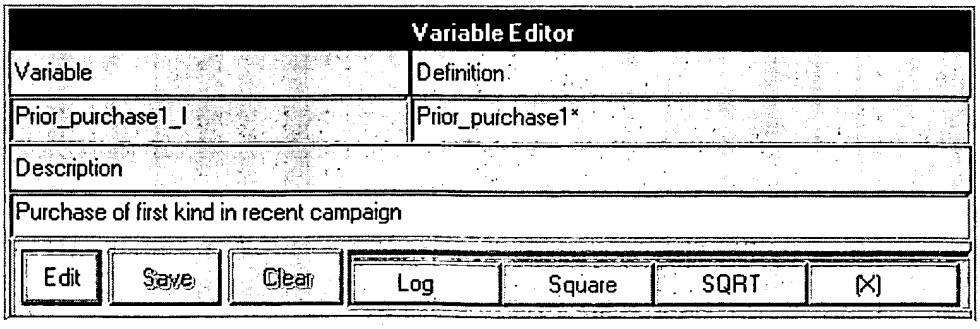


FIG. 21C

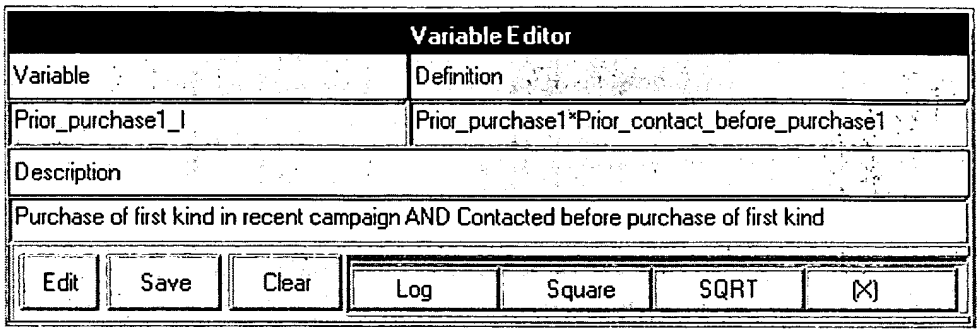


FIG. 21D

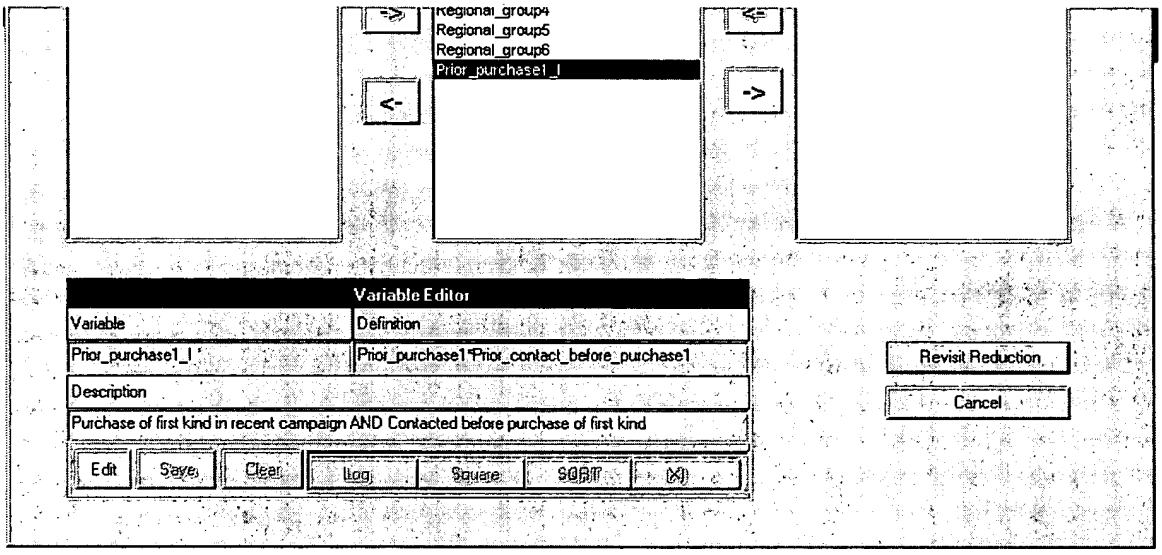


FIG. 21E

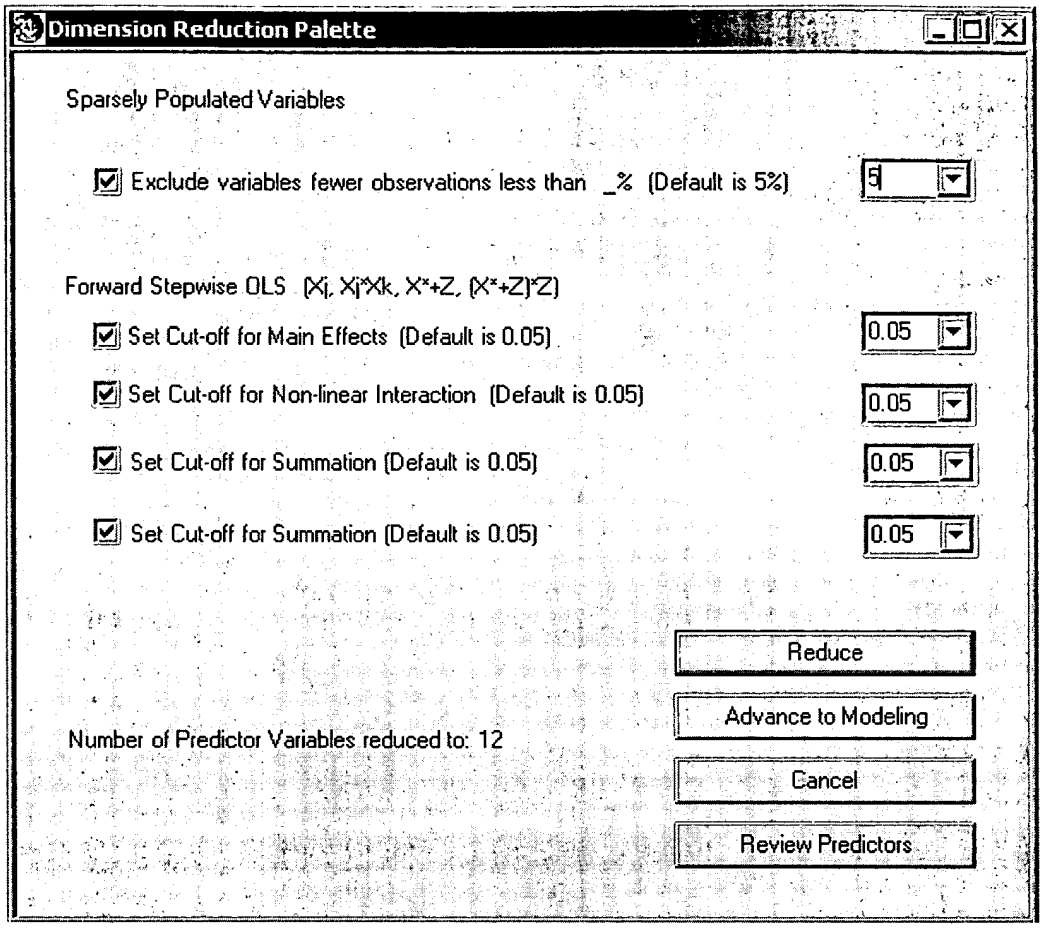

Dimension Reduction Palette
Sparsely Populated Variables
Exclude variables fewer observations less than _% (Default is 5%)
5
Forward Stepwise OLS (Xj, Xj*Xk, X*+Z, (X*+Z)*Z)
Set Cut-off for Main Effects (Default is 0.05)
0.05
Set Cut-off for Non-linear Interaction (Default is 0.05)
0.05
Set Cut-off for Summation (Default is 0.05)
0.05
Set Cut-off for Summation (Default is 0.05)
0.05
Reduce
Advance to Modeling
Number of Predictor Variables reduced to: 12
Cancel
Review Predictors

FIG. 22

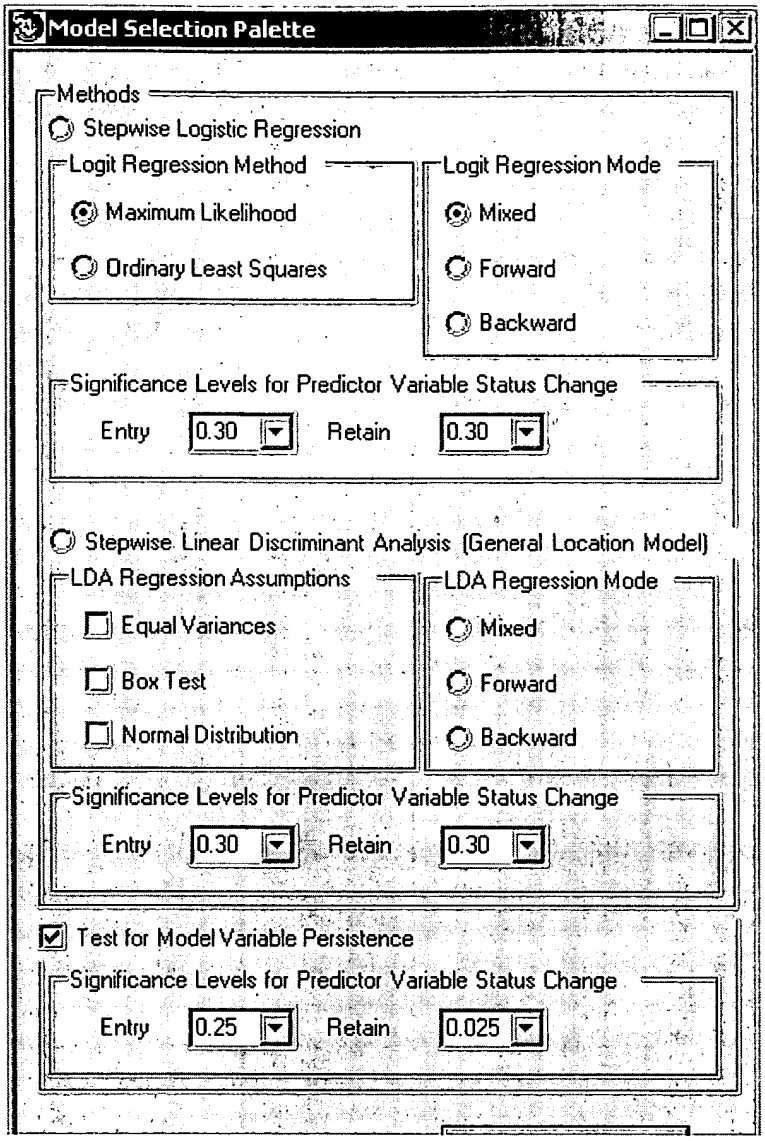
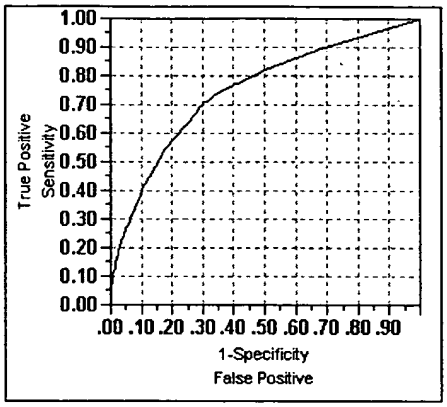

Model Selection Palette
Methods
Stepwise Logistic Regression
Logit Regression Method
Maximum Likelihood
Ordinary Least Squares
Logit Regression Mode
Mixed
Forward
Backward
Significance Levels for Predictor Variable Status Change
Entry
0.30
Retain
0.30
Stepwise Linear Discriminant Analysis (General Location Model)
LDA Regression Assumptions
Equal Variances
Box Test
Normal Distribution
LDA Regression Mode
Mixed
Forward
Backward
Significance Levels for Predictor Variable Status Change
Entry
0.30
Retain
0.30
Test for Model Variable Persistence
Significance Levels for Predictor Variable Status Change
Entry
0.25
Retain
0.025

FIG. 23A

Receiver Operating Characteristic



Using Current_Purchase='1' to be the positive level
Area Under Curve =
0.74906

Model Gains for Sample

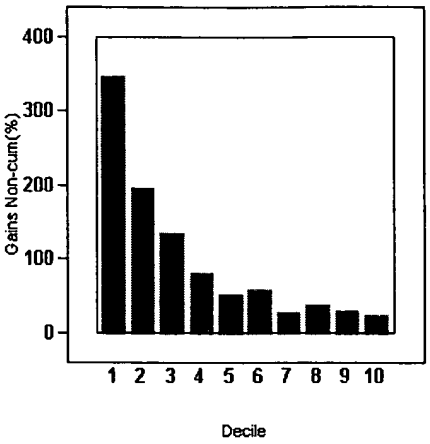


FIG. 23B

Persistence of Model for Key Predictor Variables

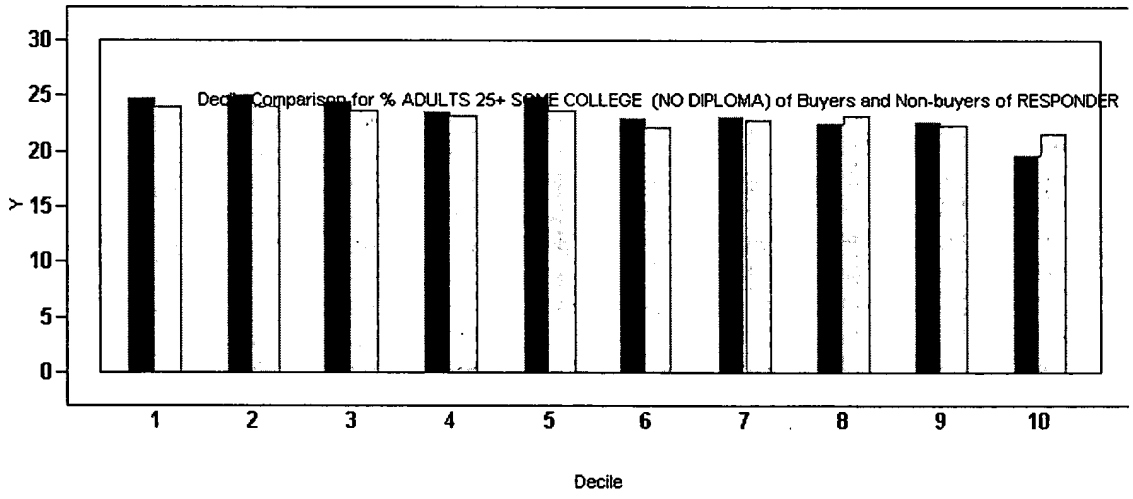


FIG. 23C

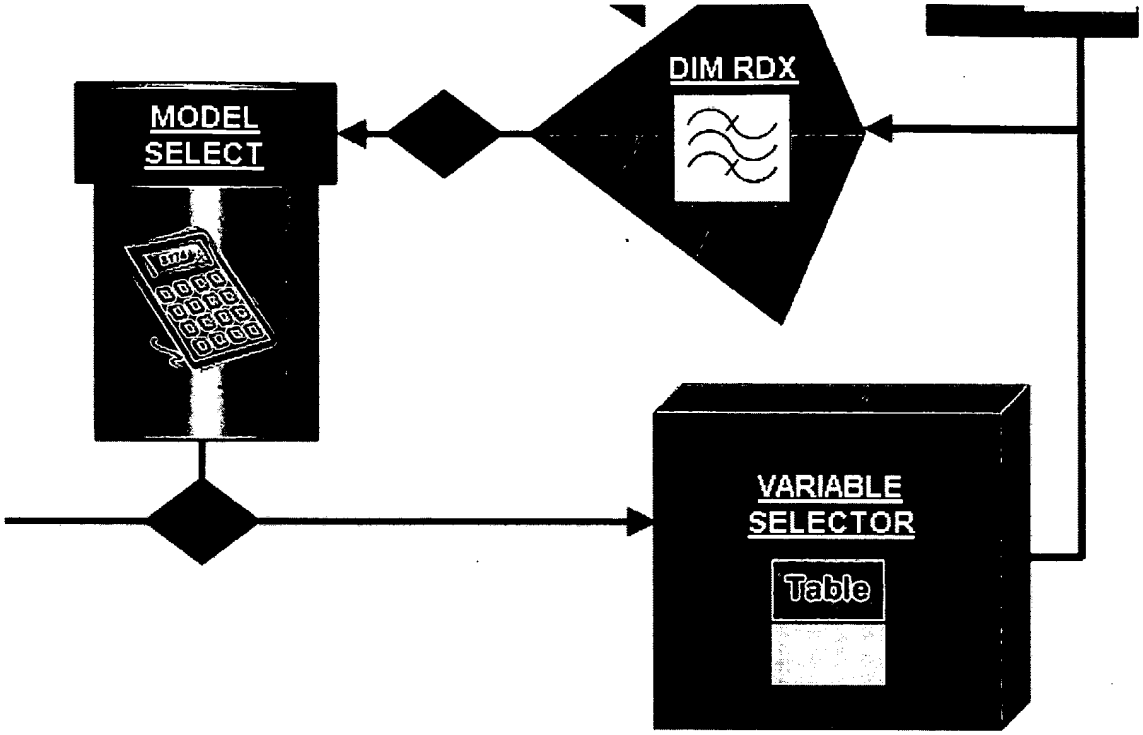


FIG. 24

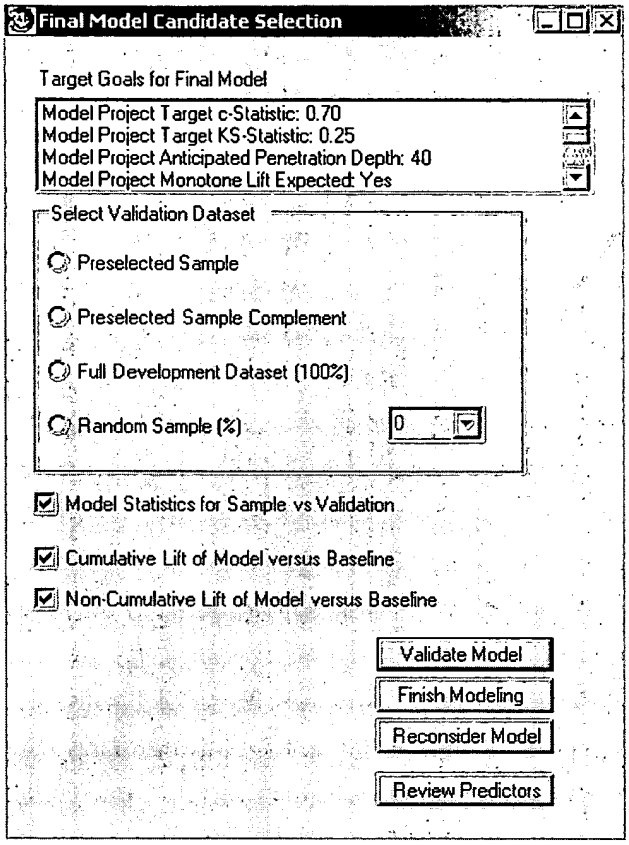
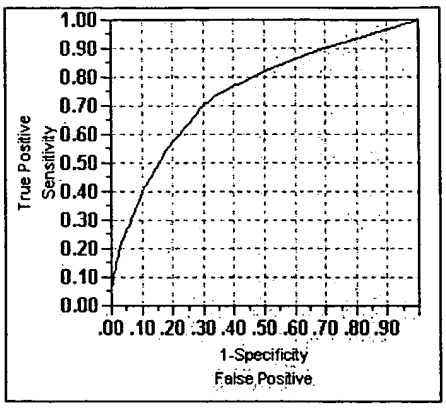

Final Model Candidate Selection
Target Goals for Final Model
Model Project Target c-Statistic: 0.70
Model Project Target KS-Statistic: 0.25
Model Project Anticipated Penetration Depth: 40
Model Project Monotone Lift Expected: Yes
Select Validation Dataset
Preselected Sample
Preselected Sample Complement
Full Development Dataset (100%)
Random Sample (%)
0
Model Statistics for Sample vs Validation
Cumulative Lift of Model versus Baseline
Non-Cumulative Lift of Model versus Baseline
Validate Model
Finish Modeling
Reconsider Model
Review Predictors

FIG. 25A

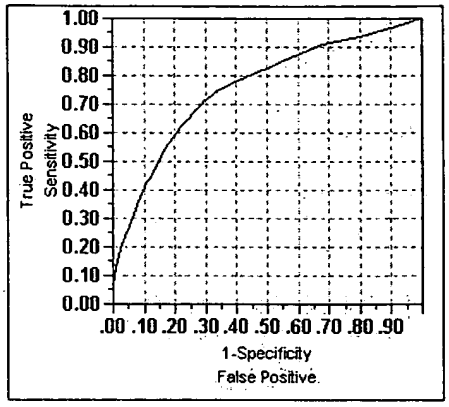
Receiver Operating Characteristic



Using Current_Purchase='1' to be the positive level
Area Under Curve =
0.74906

FIG. 25B

Receiver Operating Characteristic



Using Current_Purchase='1' to be the positive level
Area Under Curve =
0.75884

FIG. 25C

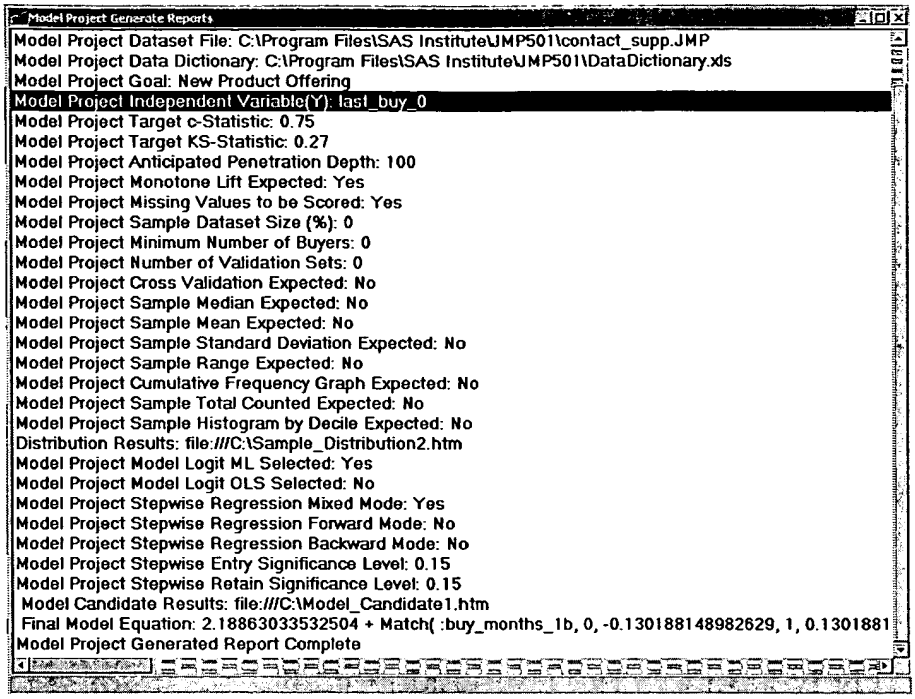

Model Project Generate Reports
Model Project Dataset File: C:\Program Files\SAS Institute\JMP501\contact_supp.JMP
Model Project Data Dictionary: C:\Program Files\SAS Institute\JMP501\DataDictionary.xls
Model Project Goal: New Product Offering
Model Project Independent Variable(Y): last_buy_0
Model Project Target c-Statistic: 0.75
Model Project Target KS-Statistic: 0.27
Model Project Anticipated Penetration Depth: 100
Model Project Monotone Lift Expected: Yes
Model Project Missing Values to be Scored: Yes
Model Project Sample Dataset Size (%): 0
Model Project Minimum Number of Buyers: 0
Model Project Number of Validation Sets: 0
Model Project Cross Validation Expected: No
Model Project Sample Median Expected: No
Model Project Sample Mean Expected: No
Model Project Sample Standard Deviation Expected: No
Model Project Sample Range Expected: No
Model Project Cumulative Frequency Graph Expected: No
Model Project Sample Total Counted Expected: No
Model Project Sample Histogram by Decile Expected: No
Distribution Results: file:///C:\Sample_Distribution2.htm
Model Project Model Logit ML Selected: Yes
Model Project Model Logit OLS Selected: No
Model Project Stepwise Regression Mixed Mode: Yes
Model Project Stepwise Regression Forward Mode: No
Model Project Stepwise Regression Backward Mode: No
Model Project Stepwise Entry Significance Level: 0.15
Model Project Stepwise Retain Significance Level: 0.15
Model Candidate Results: file:///C:\Model_Candidate1.htm
Final Model Equation: 2.18863033532504 + Match(:buy_months_1b, 0, -0.130188148982629, 1, 0.1301881
Model Project Generated Report Complete

FIG. 26

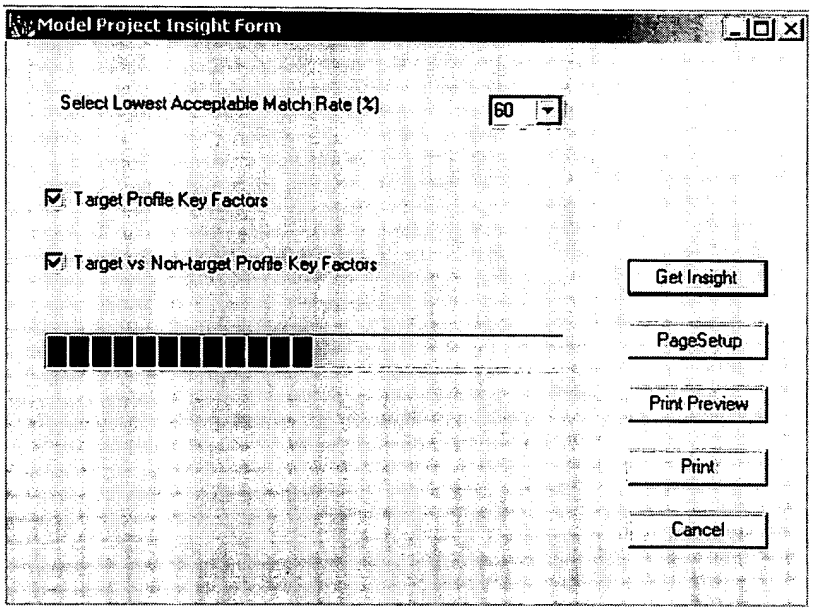


FIG. 27A

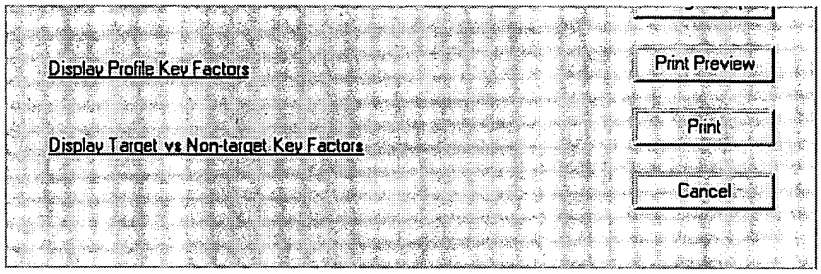


FIG. 27B

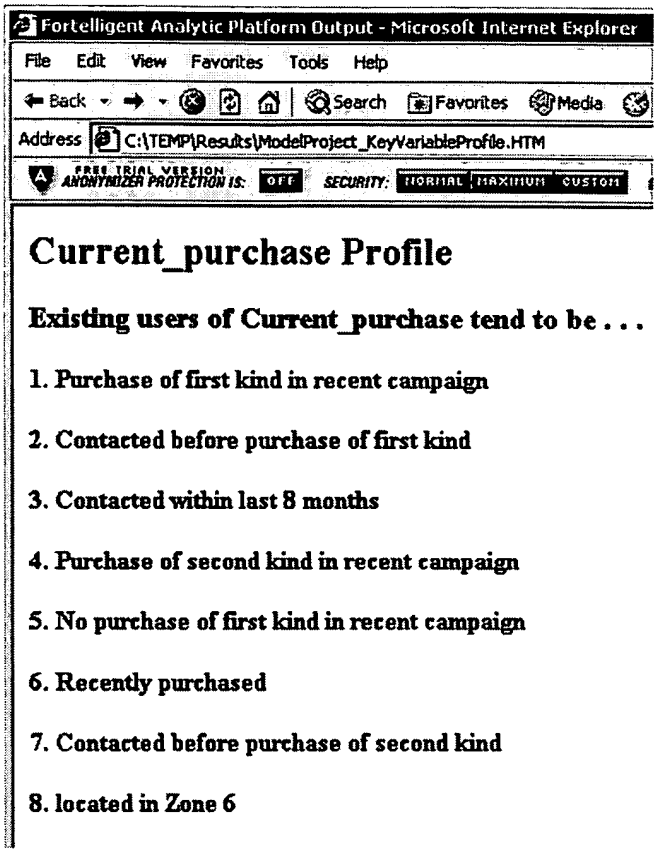


FIG. 27C

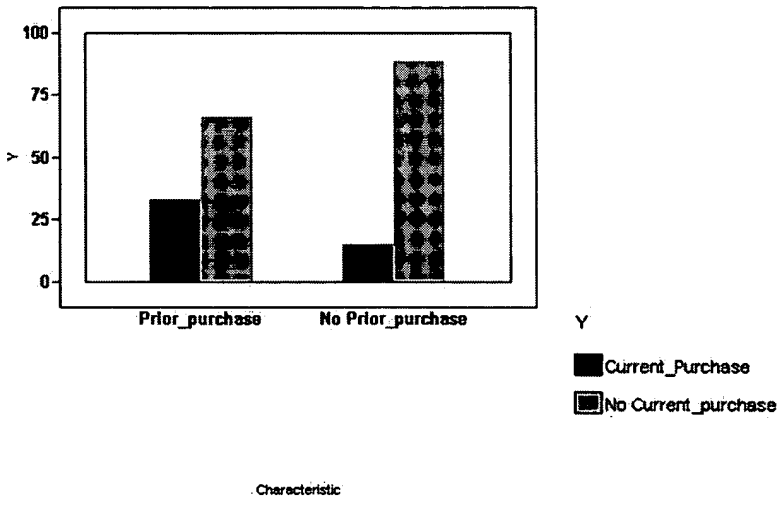


FIG. 27D